

Basewide Energy Systems Plan

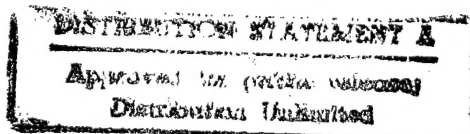
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**Executive Summary
Final Report**

Fort Jackson, South Carolina

January 1983

Prepared For
MOBILE DISTRICT CORPS OF ENGINEERS
MOBILE, ALABAMA
CONTRACT DACA01-77-C-0094



Prepared By
**BLACK & VEATCH
CONSULTING ENGINEERS
KANSAS CITY, MISSOURI**




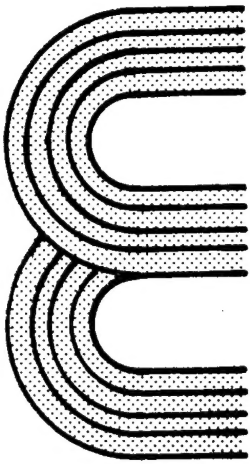
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EXECUTIVE SUMMARY - INCREMENTS A, B, C, D and E

This is a summary of the results for Increments A, B, C, D and E of the Basewide Energy Systems Plan for Fort Jackson, South Carolina (the results for Increments F and G are summarized on pages 5 and 6). This plan includes analyses and recommendations of energy conservation projects for reduction of the installation's present energy consumption. The installation should be aware that savings figures presented in this summary can only be realized after all projects have been implemented. Black & Veatch has developed projects that would meet the funding requirements for the energy conservation program. Furthermore, the recommended projects provide partial compliance with the energy conservation requirement for the installation as outlined in the Army Facilities Energy Plan. This summary presents data on the following:

- Existing energy consumption
- Source energy reductions due to energy conservation techniques for buildings and their systems
- Application of solar energy to reduce fossil fuel consumption
- Savings utilizing central energy monitoring and control systems (EMCS)
- Use of solid waste as an alternate energy source
- Analysis of Total Energy/Selective Energy (TE/SE) systems

Tables 1 and 2 present information pertaining to the physical descriptions and energy consumption of 49 typical buildings used to verify historical energy consumption in the development of the basewide

energy use model. This model was then utilized as the foundation for energy conservation project analyses and recommendations. Table 3 summarizes the daily personnel occupancy for each typical building. Tables 1, 2 and 3 also provide information which may be used to estimate source energy consumption for similar buildings within the designated groupings (See Appendix A for all tables referenced in this report). The estimated annual source energy consumption for all building types contributing to the basewide annual total of 2,610,664 mega-Btu, consumed during base year 1975, is shown on Figure 1.

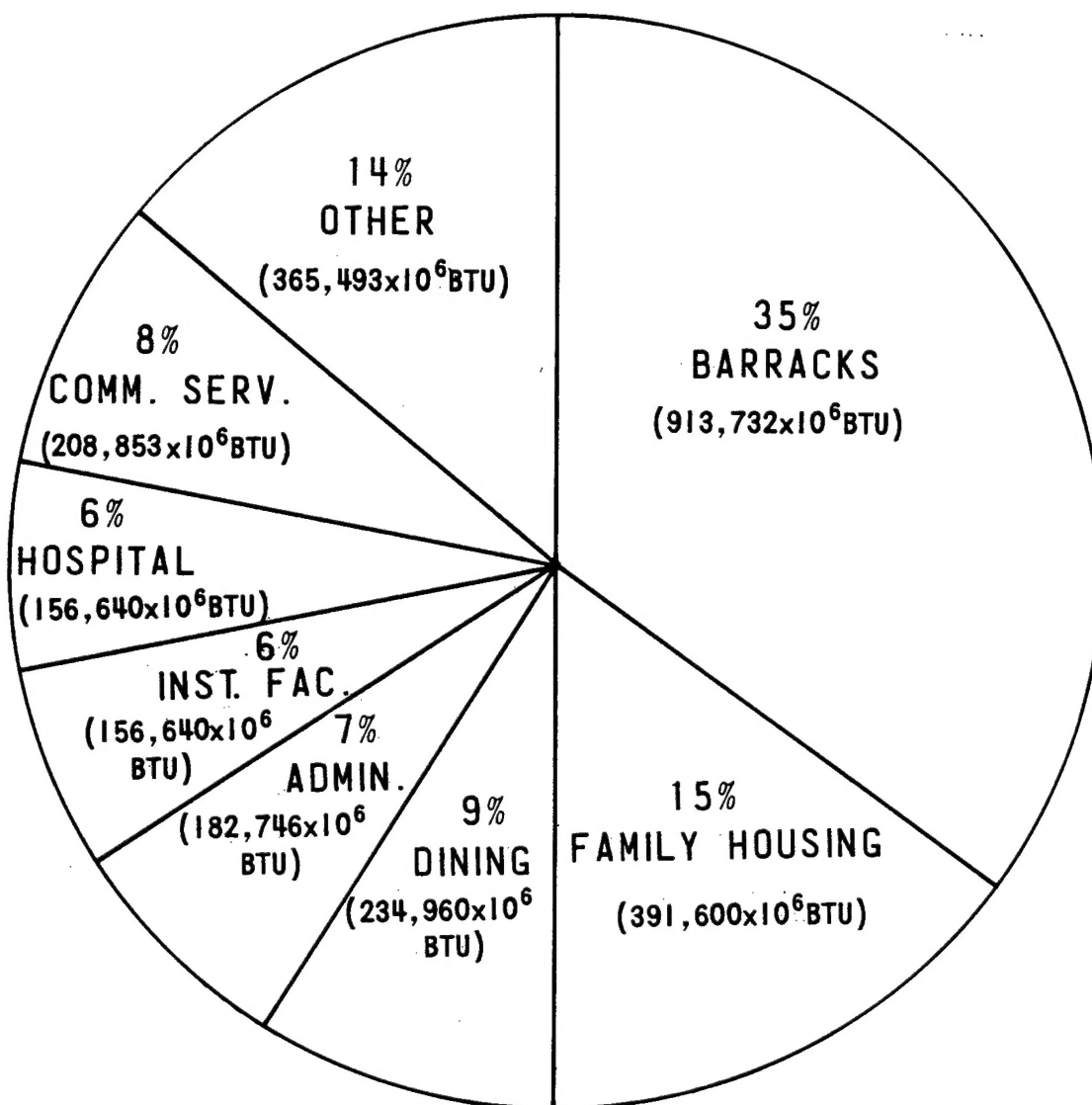
Table 4 indicates the annual source energy consumed by each of the significant building groups used in our basewide energy model. The model was within 10 percent of the historical source energy consumption for FY 1978 shown below.

Yearly Source Energy
Consumption in Btu x 10⁶

1978

Electricity	1,093,555
Natural Gas	1,087,538
Propane Gas	7,135
Fuel Oil No. 1 & 2	201,868
Fuel Oil No. 5 & 6	<u>327,925</u>
TOTAL	2,718,021

The total estimated source energy savings due to implementation of all feasible energy conservation projects developed within the scope of this study is 596,984 mega-Btu/year. These projects consisted of various architectural improvements, and mechanical and electrical system modifications.



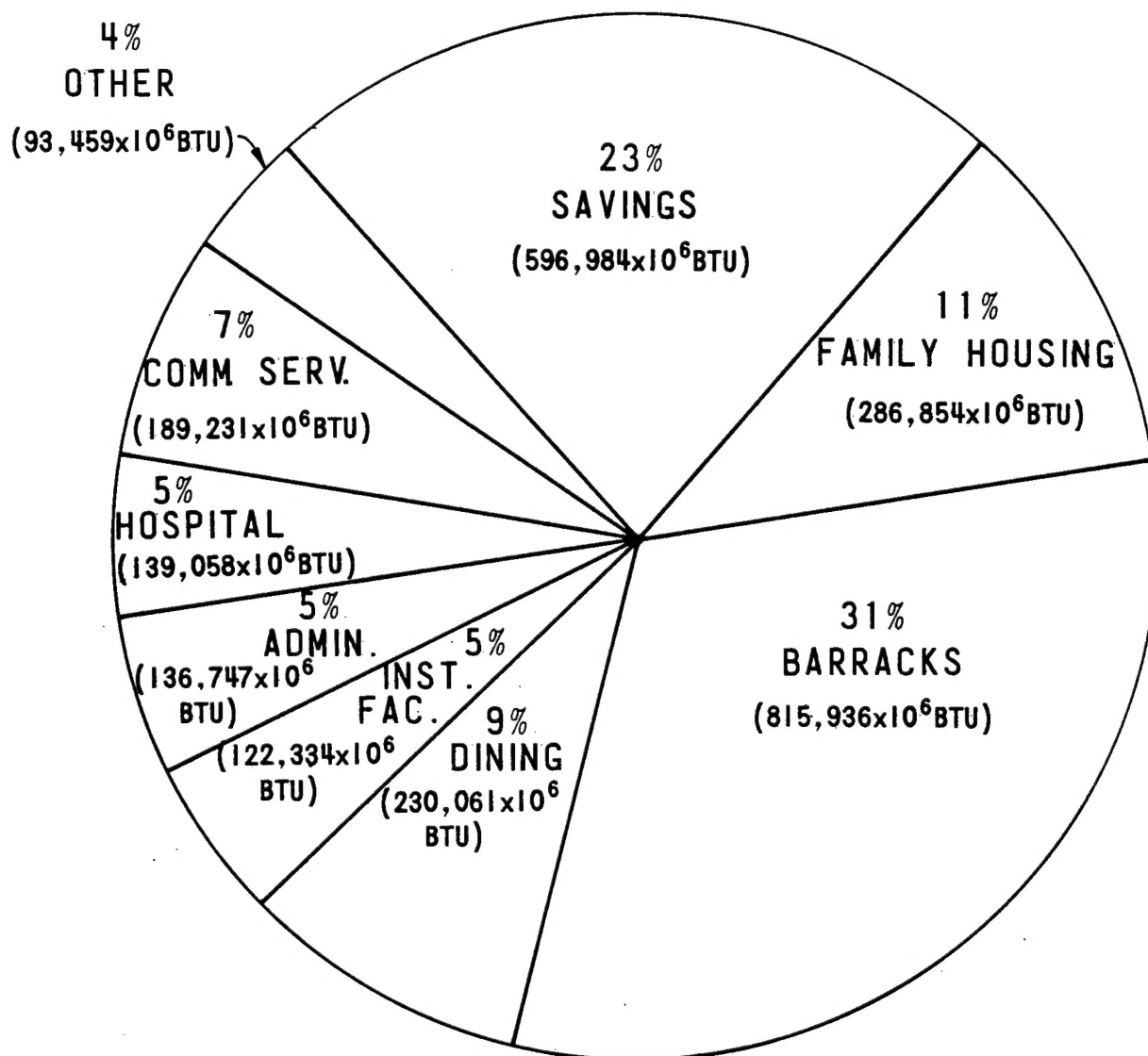
BASEWIDE CONSUMPTION FY '75

(2,610,664x10⁶BTU)

FIGURE 1

Table 5 lists the project number, percent of basewide reduction, and the source energy savings for the indicated building types. Figure 2 illustrates the combined effect of the recommended energy saving improvements, as compared to the FY 1975 source energy expenditure. Our estimates indicate a savings of approximately 23 percent over the base year (1975). Figure 3 illustrates the relative percent reduction for significant building groups comprising the 596,984 mega-Btu/year.

A detailed analysis of the projects listed in Table 5 is included in the following reports. Further explanation of the historical energy consumption, basewide energy model, and energy conservation analysis can be found in the Energy Use Survey. Utilizing solar energy, a renewable energy source, to reduce Fort Jackson's dependence on nonrenewable energy sources revealed that the projects investigated would be economically impracticable. Eight concepts were evaluated, and are presented in the Solar Energy Applications and Evaluation. The Energy Monitoring and Control Systems (EMCS) study includes recommendations for additional energy saving programs supplementing the EMCS system under design and the utilization of an FM control system. The additions to the EMCS system under design would result in a savings of 101,568 mega-Btu/year, while the FM control system would save 44,592 mega-Btu/year. The investigation of solid waste for reducing source energy consumption at Fort Jackson resulted in the development of Project No. T-529, which recommends the installation of a solid waste-burning incinerator facility to provide steam to the existing steam distribution system. The proposed plant,



BASEWIDE CONSUMPTION AFTER ENERGY
CONSERVATION PROJECTS

$(2,013,680 \times 10^6 \text{ BTU})$

FIGURE 2

ALLOCATION OF ENERGY CONSERVATION PROJECTS SAVINGS

FOR SIGNIFICANT BUILDING GROUPS

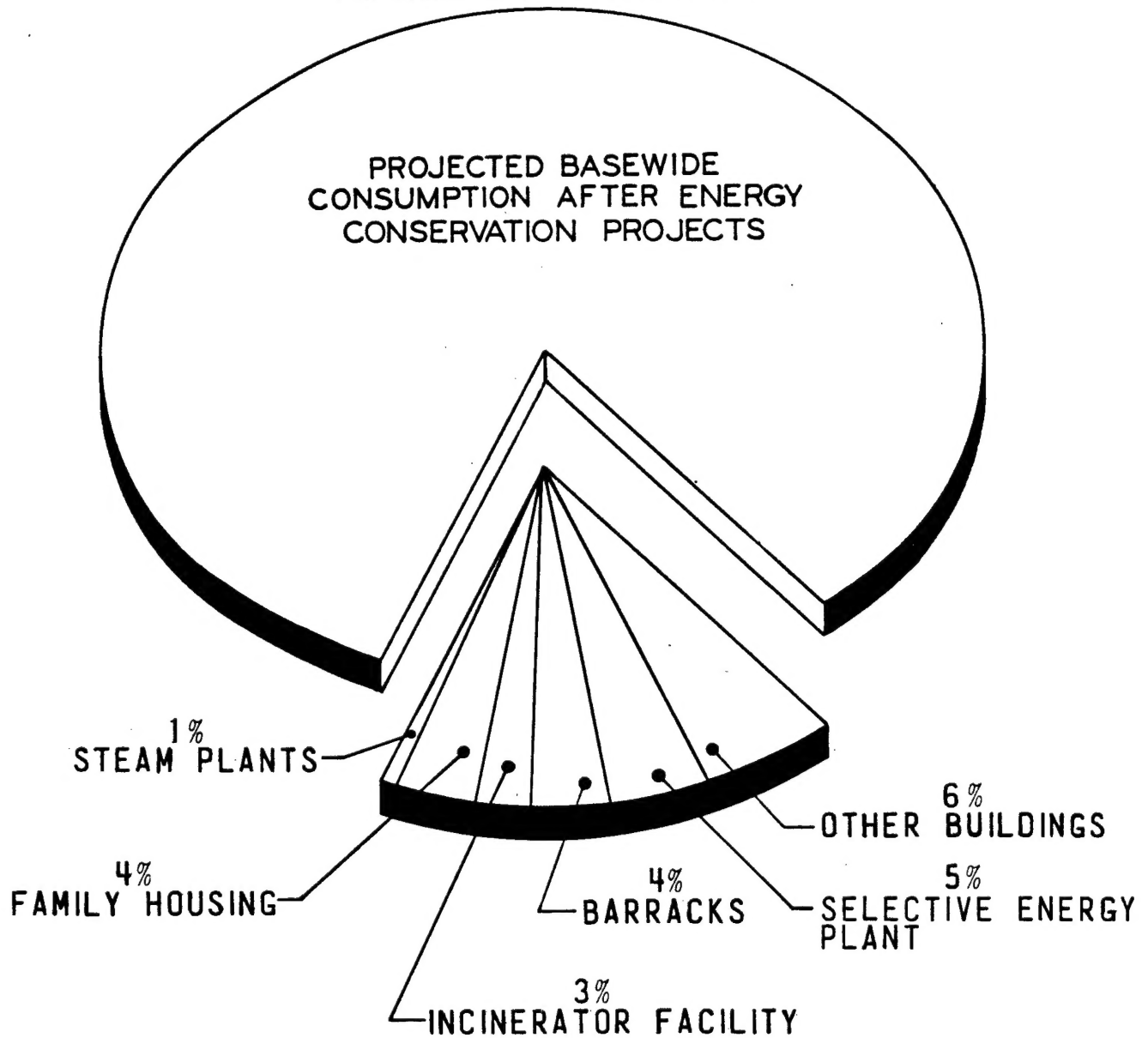


FIGURE 3

to be located near existing Central Energy Plant No. 4333, would provide reduction in both fuel oil and electric consumption totalling 81,113 mega-Btu/year. The details and descriptions of the systems analyzed can be found in the report entitled Total Energy, Selective Energy, and Central Boiler Plants.

The incorporation of a total energy system at this installation would not be recommended. However, a selective energy plant utilizing coal-fired boilers is being recommended. The basewide consumption of fuel oil and natural gas would be reduced by 50 percent, while generating 19 percent of the electrical power required at Fort Jackson. The total annual source energy savings would amount to 5 percent. Detailed descriptions of the TE/SE systems analyzed are included in the Total Energy, Selective Energy, and Central Boiler Plants report.

Table 6 was developed to give a prioritized schedule, in order of fiscal year, for implementing the recommended energy conservation projects.

EXECUTIVE SUMMARY-INCREMENTS F AND G

Increment F - Facilities Engineer Conservation Measures.

Increment G - Maintenance, Repair, and Minor Construction Projects.

This is a summary of the two phases of work that were started after the completion of Increments A, B, C, D, and E in May of 1980. Increments F and G were completed in November, 1982.

The purpose of Increment F of the Basewide Energy Systems Plan is to identify and develop recommendations that can be used by Fort Jackson in preparing its energy management plan. Included are a number of comparatively low cost projects, recommendations for training, and prioritized lists of possible energy conservation measures. Increment G identified maintenance, repair, and minor construction projects for the purpose of conserving energy. These are energy conservation projects that did not meet ECIP criteria or did not fit the ECIP program at the time that the remainder of the study was completed.

The average costs of energy for FY 1981 are given in Table 7. These costs have been used as the basis for determining the dollar savings per year.

Recommended projects developed within the scope of Increments F and G of the study are summarized in Tables 8 and 9 respectively. Projects are prioritized by their E/C ratio. The E/C ratio is defined as the ratio of yearly energy savings in million Btu to the cost estimate in thousands of dollars. Any project showing a payback of 15 years or less is recommended. Cost estimates are representative of April, 1981 prices.

At the request of Fort Jackson, 1391's were prepared for two of the projects developed under Increment G. The first, Hospital Modification, involves converting the existing Dual Duct HVAC system to a Variable Air Volume system. The second project, EMCS Extension, involves installing reset controls at Moncrief Hospital.

Figure 4 is a pie chart showing projected future energy savings due to ECIP projects developed under Increments A, B, C, D, and E and projects developed under Increments F and G.

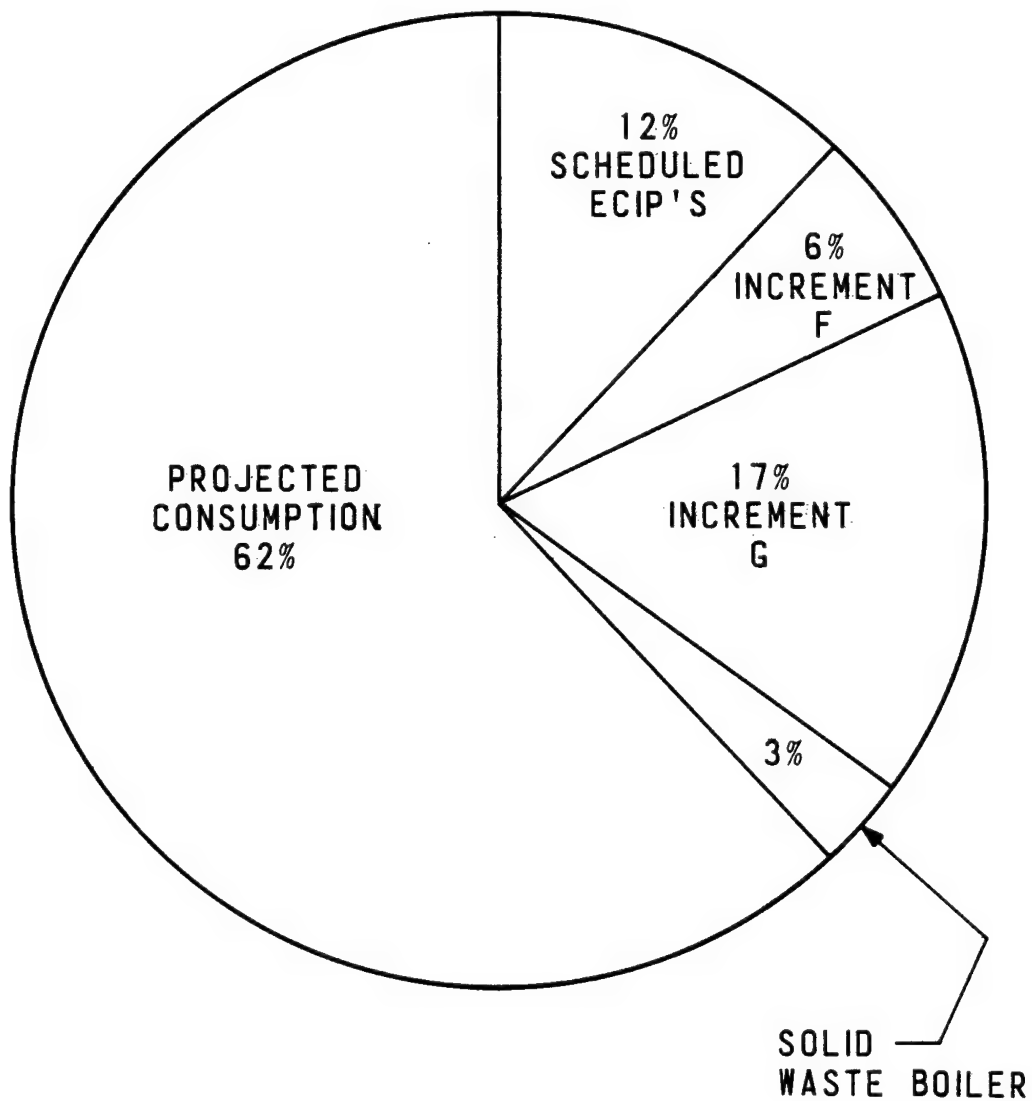
Figure 5 represents a forecast of Fort Jackson's future energy costs. The figure shows how costs could escalate if no energy conservation projects are implemented and what also could happen if all cost effective projects are implemented. The energy conservation projects would more than likely be implemented in three phases:

Phase I - ECIP.

Phase II - Increments F and G and Solid Waste Plant.

Phase III - Selective Energy Plant that would burn coal to produce all the steam requirements and part of the electrical requirements at Fort Jackson.

The curve shows a modest increase in FY86 due to new buildings. The large decrease shown in FY89 is primarily due to using coal, a cheaper fuel, in the Selective Energy Plant.



FORT JACKSON
BASEWIDE CONSUMPTION FY '81
(2,625,074x10⁶BTU'S)

FIGURE 4

EFFECT OF ESCALATION AND ENERGY CONSERVATION ON FUEL COST

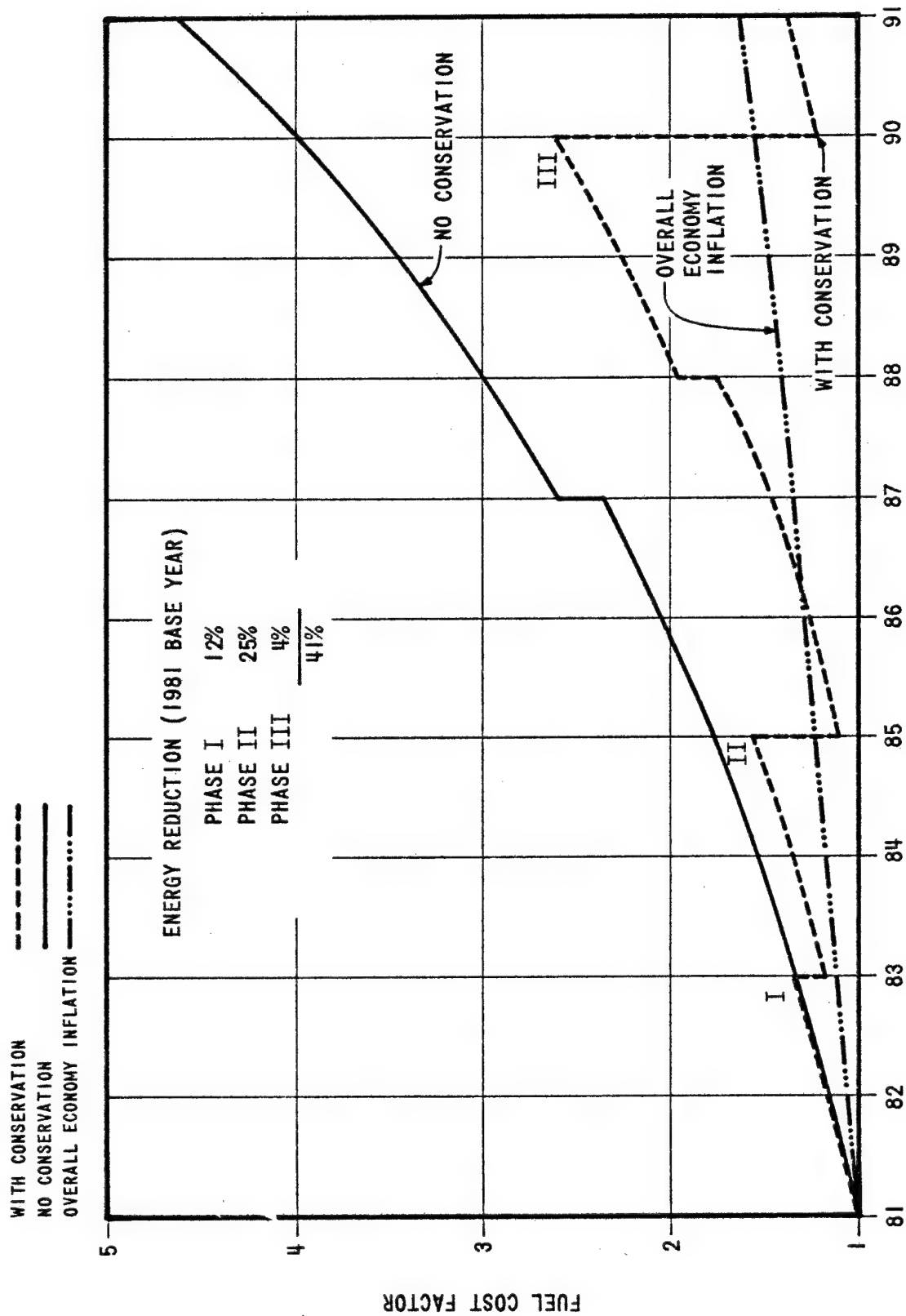


FIGURE 5

APPENDIX A

TABLES

TABLE I
TYPICAL BUILDING CONSTRUCTION DATA
FORT JACKSON

GROUP NO.	BLOG.	BUILDING DESCRIPTION	NO. FLS.	CONSTRUCTION										"U" VALUES										WINDOW SQ. FT.	AREA (FT. ²)	COOLING		HEATING		PEAK TRNS LOAD MBH		DOMESTIC HOT WATER	
				ROOF	WALL	FLOOR	WINDOW	DOOR	ROOF	WALL	FLOOR	WINDOW	DOOR	ROOF	WALL	FLOOR	WINDOW	DOOR	SYSTEM	CAP. (TONS)	SYSTEM	FUEL	GAIN			LOSS	CAP. (G)	FUEL					
A-1	2200	SUPPLY/STORAGE	1	BUILT-UP	BRICK & CONC. BLOCK	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL HOLLOW CORE	.18	.30	-	1.13	.85	3061	13976	3061	21	C.E. 2288	HTHW	49.4	197.7	75	ELEC										
A-2	4340	BRIGADE HEADQUARTERS	3	BUILT-UP	BRICK & CMU	BASEMENT	SINGLE CLEAR GLASS	METAL HOLLOW CORE	.05	.34	-	1.13	.55	672	9955	672	1	C.E. 4333	HTHW	1	130.8	75	GAS										
A-3	5448	ADMINISTRATION	1	COMPOSITE SHINGLES	T & G ON WOOD FRAME	TILE, OPEN CRAWL SPACE	SINGLE CLEAR GLASS	WOOD, SOLID CORE	.26	.23	.53	1.13	.49	841	8020	841	21	B.P. 5485	STEAM	87.0	201.6	40	ELEC										
A-4	9702	HEADQUARTERS	1	COMPOSITE SHINGLES	T & G ON WOOD FRAME	TILE, OPEN CRAWL SPACE	SINGLE CLEAR GLASS	WOOD, SOLID CORE	.26	.23	.53	1.13	.49	240	2284	240	-	FURNACE	GAS	-	112.0	40	ELEC										
B-1	9524	B.O.O.	1	COMPOSITE SHINGLES	CLAPBOARD ON WOOD FRAME	TILE, OPEN CRAWL SPACE	SINGLE CLEAR GLASS	WOOD, SOLID CORE	.05	.36	.54	1.13	.49	140	1512	140	6	BOILER	OIL	17.1	35.7	66	ELEC										
B-2	9545	BARRACKS	2	ASPHALT SHINGLES	WOOD SIDING & FRAME	WOOD	SINGLE CLEAR GLASS	METAL HOLLOW CORE	.07	.25	.16	1.13	.55	734	5310	734	-	FURNACE	GAS	-	88.8	85	GAS										
B-3	2205	BARRACKS	3	BUILT-UP	BRICK ON CONC. FRAME	TILE, VENTED CRAWL SPACE	SINGLE CLEAR GLASS	STEEL HOLLOW CORE	.04	.29	.52	1.13	.55	4928	41496	4928	60	C.E. 2288	HTHW	559.7	229.0	300	HTHW										
B-4	5422	BARRACKS/MESS	3	BUILT-UP	CONCRETE BLOCK	SLAB ON GRADE	SINGLE CLEAR GLASS	STEEL HOLLOW CORE	.07	.27	-	1.13	.55	26207	329165	26207	171	C.E. 4333	HTHW	3188	1162	1000	HTHW										
CS-1	9510	THEATRE	1	ASPHALT SHINGLES	WOOD SIDING & FRAME	WOOD, CLOSED CRAWL SPACE	SINGLE CLEAR GLASS	WOOD, SOLID CORE	.27	.19	.37	1.13	.49	82	12139	82	78	BOILER	GAS	77.6	224.0	NONE	-										
CS-2	9631	BARBER SHOP	1	COMPOSITE SHINGLES	CLAPBOARD ON WOOD FRAME	TILE, VENTED CRAWL SPACE	SINGLE CLEAR GLASS	METAL HOLLOW CORE	.05	.36	.46	1.13	.55	231	1150	231	-	FURNACE	OIL	-	19.2	75	ELEC										
CS-4	5346	EDUCATION CENTER	1	COMPOSITE SHINGLES	CLAPBOARD ON WOOD FRAME	TILE, OPEN CRAWL SPACE	SINGLE CLEAR GLASS	WOOD, SOLID CORE	.26	.36	.54	1.13	.49	118	4074	118	12	B.P. 5485	STEAM	84.5	195.2	NONE	-										
CS-5	2009	GYMNASIUM	1	BUILT-UP	CMU	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL HOLLOW CORE	.07	.51	-	1.13	.55	1676	20286	1676	-	C.E. 2288	HTHW	-	448.9	85	HTHW										
CS-6	4522	SERVICE STATION	1	BUILT-UP	CONCRETE BLOCK	SLAB ON GRADE	SINGLE CLEAR GLASS	STEEL HOLLOW CORE	.56	.53	-	1.13	.55	258	3087	258	3	FURNACE	OIL	16.2	127.3	NONE	-										
CS-7	2395	BOWLING CENTER	1	BUILT-UP	BRICK & CONC. BLOCK	SLAB ON GRADE	SINGLE CLEAR GLASS	STEEL HOLLOW CORE	.2	.3	-	1.13	.55	49	20380	49	39	C.E. 2288	HTHW	336.2	293.7	30	ELEC										
CS-8	10742	DAY ROOM	1	COMPOSITE SHINGLES	CLAPBOARD ON WOOD FRAME	TILE, OPEN CRAWL SPACE	SINGLE CLEAR GLASS	WOOD, SOLID CORE	.05	.36	.54	1.13	.49	340	1250	340	-	FURNACE	GAS	-	75.8	40	GAS										
CS-9	8568	TRANSPORTATION OFFICE	2	ASPHALT SHINGLES	WOOD SIDING & FRAME	WOOD, OPEN CRAWL SPACE	SINGLE CLEAR GLASS	STEEL HOLLOW CORE	.07	.25	.16	1.13	.55	632	4720	632	12	BOILER	OIL	18.9	97.6	NONE	-										
CS-10	2558	LATRINE	1	WOOD	BLOCK	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD, SOLID CORE	.17	.36	-	1.13	.49	27	358	27	-	FURNACE	GAS	-	11.9	90	GAS										
CS-11	4282	TELEPHONE EXCHANGE BLDG.	1	BUILT-UP	STUCCO ON CONC. BLOCK	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL HOLLOW CORE	.1	.46	-	1.13	.55	33	3640	33	12	BOILER	HOT WATER	38.0	97.6	NONE	-										
D-1	12111	MESS	1	COMPOSITE SHINGLES	CLAPBOARD ON WOOD FRAME	TILE, CLOSED CRAWL SPACE	SINGLE CLEAR GLASS	METAL HOLLOW CORE	.05	.32	.23	1.13	.55	397	2360	397	-	UNIT HEATERS	GAS	-	65.1	100	GAS										
D-2	3210	MESS	1	BUILT-UP	BRICK & CMU	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL HOLLOW CORE	.04	.25	-	1.13	.55	1521	13280	1521	51	C.E. 2288	HTHW	56.0	145.3	300	HTHW										
D-3	3630	OFFICER'S MESS	1	BUILT-UP	WOOD SIDING & FRAME	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD, SOLID CORE	.04	.07	-	1.13	.49	1192	20788	1192	150	BOILER	OIL	59.3	217.8	100	OIL										
E-2	5615	PRIMARY EDUCATION	1	BUILT-UP	CONC. BLOCK & BRICK	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL HOLLOW CORE	.42	.43	-	1.13	.55	3702	22667	3702	99	BOILER	OIL	355.2	937.9	90	OIL										
FN-1	3773	FAMILY HOUSING	2	ASPHALT SHINGLES	BRICK WOOD	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD, SOLID CORE	.08	.09	.11	1.13	.49	722	9408	722	9	FURNACE	GAS	35.6	91.4	40	GAS										
FN-2	5724	FAMILY HOUSING	2	ASPHALT SHINGLES	WOOD SIDING & FRAME	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD, SOLID CORE	.07	.07	-	1.13	.49	1182	5488	1182	24	FURNACE	GAS	33.7	91.8	40	GAS										
FN-3	6832	FAMILY HOUSING	2	BUILT-UP	ASPH. SHINGLES	BASEMENT	SINGLE CLEAR GLASS	WOOD, SOLID CORE	.07	.06	-	1.13	.49	274	2910	274	9	FURNACE	GAS	12.7	35.4	40	GAS										
FN-4	6841	FAMILY HOUSING	1	BUILT-UP	ASPH. SHINGLES	HARDWOOD	SINGLE CLEAR GLASS	WOOD, SOLID CORE	.07	.07	.64	1.13	.49	209	2142	209	9	FURNACE	GAS	18.6	44.9	30	GAS										

1. TYPICAL BUILDING LISTED HAS COOLING, HOWEVER BASESIDE ENERGY MODEL DOES NOT INCLUDE ANY SOURCE ENERGY CONSUMPTION FOR COOLING.

TABLE I (CONT'D)
TYPICAL BUILDING CONSTRUCTION DATA
FORT JACKSON

GROUP NO.	BLDG NO.	BUILDING DESCRIPTION	NO. FLS	CONSTRUCTION						"U" VALUES				WINDOW SQ. FT.	AREA (FT. ²)	COOLING		HEATING		PEAK TRNS LOAD HHV		DOMESTIC HOT WATER	
				ROOF	WALL	FLOOR	WINDOW	DOOR	ROOF	WALL	FLOOR	WINDOW	DOOR			SYSTEM	CAP. (TONS)	SYSTEM	FUEL	GAIN	LOSS	CAP. (G)	FUEL
FN-5	5716	FAMILY HOUSING	1	ASPHALT SHINGLES	WOOD SIDING & FRAME	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD SOLID CORE	.07	.10	-	1.13 .89 1.06 .87		273	2260	COND. UNITS	6	FURNACE	GAS	11.5	40.2	30	GAS
FN-6	3600	FAMILY HOUSING	1	ASPHALT SHINGLES	WOOD SIDING & FRAME	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD SOLID CORE	.07	.12	-	1.13 .89 1.06 .87		297	2033	COND. UNITS	6	FURNACE	GAS	7.6	29.0	30	GAS
FN-7	3803	FAMILY HOUSING	2	ASPHALT SHINGLES	WOOD SIDING & FRAME	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD SOLID CORE	.05	.07	-	1.13 .89 1.06 .87		533	3889	COND. UNITS	3	FURNACE	GAS	16.0	55.2	80	GAS
H-1	6849	OFFICE MOTIVATION PLATOON	1	COMPOSITE SHINGLES	CLAPBOARD ON WOOD PANELING	TILE, CLOSED CRAWL SPACE	SINGLE CLEAR GLASS	WOOD SOLID CORE	.26	.23	.23	1.13 .89 1.06 .87		426	2284	NONE	-	FURNACE	GAS	-	115.6	40	GAS
H-4	4323	DENTAL CLINIC	1	BUILT-UP	CONCRETE BLOCK, BRICK	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL HOLLOW CORE	.04	.29	-	1.13 .55 1.06 .55		487	11897	CENTRAL PLANT	51	C. E. 4333	HTW	41.6	171.6	200	HTW
I-1	10404	TRAINING	1	BUILT-UP	CONCRETE BLOCK	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD SOLID CORE	.38	.43	-	1.13 .55 1.06 .55		564	3747	COND. UNIT	15	FURNACE	GAS	57.5	136.8	40	GAS
I-3	5462	FIRST-AID CLASSROOM	1	COMPOSITE SHINGLES	CLAPBOARD ON WOOD FRAME	TILE, OPEN CRAWL SPACE	SINGLE CLEAR GLASS	WOOD SOLID CORE	.26	.36	.54	1.13 .89 1.06 .87		151	5227	NONE	-	B. P. 5485	STEAM	-	233.2	NONE	-
I-4	2300	INSTRUCTION FACILITY	3	ASPHALT SHINGLES	CLAY TILE	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD SOLID CORE	.08	.32	-	1.13 .89 1.06 .87		1567	67661	CENTRAL PLANT	1.	C. E. 2286	HTW	1.	862.3	90	HTW
L-1	1561	LAUNDRY	1	BUILT-UP	CLAPBOARD ON WOOD FRAME	CONC., CLOSED CRAWL SPACE	SINGLE CLEAR GLASS	WOOD SOLID CORE	.45	.21	.59	1.13 .89 1.06 .87		1672	53665	NONE	-	B. P. 1553	STEAM	-	937.6	N/A	STEAM
LA-1	9504	LABORATORY	1	BUILT-UP	CONCRETE BLOCK	BASEMENT	SINGLE CLEAR GLASS	STEEL HOLLOW CORE	.05	.32	-	1.13 .55 1.06 .55		142	5782	NONE	-	BOILER	GAS	-	542.3	30	GAS
LA-2	1895	RECEPTION	2	BUILT-UP	CONCRETE BLOCK, BRICK	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL HOLLOW CORE	.21	.30	-	1.13 .89 1.06 .87		231	3108	NONE	-	FURNACE	DIL	-	75.62	NONE	-
M-1	6500	MAINTENANCE	1	COMPOSITE SHINGLES	CLAPBOARD ON WOOD FRAME	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD SOLID CORE	.44	.27	-	1.13 .89 1.06 .87		5735	13187	CHILLER	380	BOILER	HTW	435.9	1403.2	200	STEAM
M-2	3033	MOTOR REPAIR SHOP	1	CONCRETE SLAB	BRICK & CMU	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL HOLLOW CORE	.26	.36	-	1.13 .55 1.06 .55		995	4787	NONE	-	BOILER	HTW	-	130.8	75	GAS
M-3	1611	TANK REPAIR SHOP	1	BUILT-UP	CORRUGATED METAL SIDING	T & G FLOORING	SINGLE CLEAR GLASS	METAL HOLLOW CORE	.27	1.11	.83	1.13 .55 1.06 .55		5110	24838	WINDOW UNIT	3	BOILER	DIL	13.1	806.2	75	DIL
R-1	12104	CHAPEL	1	COMPOSITE SHINGLES	CLAPBOARD ON WOOD FRAME	T & G, CLOSED CRAWL SPACE	SINGLE CLEAR GLASS	WOOD SOLID CORE	.34	.26	.19	1.13 .89 1.06 .87		582	3846	COND. UNIT	36	BOILER	GAS	53.0	133.2	30	GAS
R-2	11550	CHAPEL	1	COMPOSITE SHINGLES	CLAPBOARD ON WOOD FRAME	T & G, CLOSED CRAWL SPACE	SINGLE CLEAR GLASS	WOOD SOLID CORE	.34	.26	.19	1.13 .89 1.06 .87		500	3300	NONE	-	FURNACE	DIL	-	111.0	30	DIL
U-2		ALL BLDGS. IN THE GROUP							NOT APPLICABLE						9427			NOT APPLICABLE					
U-3		ALL BLDGS. IN THE GROUP							NOT APPLICABLE						3631			NOT APPLICABLE					
U-4		HEATING & COOLING PLANT							NOT APPLICABLE						6303			NOT APPLICABLE					
W-1	2530	WAREHOUSE	1	ASPHALT SHINGLES	CLAPBOARD ON WOOD FRAME	CONCRETE, OPEN CRAWL SPACE	SINGLE CLEAR GLASS	WOOD SOLID CORE	.44	.36	.84	1.13 .89 1.06 .87		45	9373	WINDOW UNIT	3	SPACE HEATERS	GAS	26.5	93.4	40	GAS
X		NO UTILITIES							NOT APPLICABLE														
Z		ALL BLDG. IN THE GROUP							NOT APPLICABLE														

1. TYPICAL BUILDING LISTED HAS COOLING, HOWEVER BASESIDE ENERGY MODEL DOES NOT INCLUDE ANY SOURCE ENERGY CONSUMPTION FOR COOLING.

TABLE 2
TYPICAL BUILDING ENERGY CONSUMPTION DATA
FORT JACKSON

GROUP NO.	BLDG.	BUILDING DESCRIPTION	ANNUAL ENERGY SOURCE CONSUMPTION BTU x 10 ⁶			ELEC'L ENER. CONSUMPTION		BTU x 10 ³ FT ²
			FUEL	ELEC.	TOTAL	KW PEAK	KWH/YR	
A-1	2200	SUPPLY/STORAGE	1369	537	1906	15	46237	146.9
A-2	4340	BRIGADE HEADQUARTERS	564	1507	2071	27	129884	208.0
A-3	5448	ADMINISTRATION	898	691	1589	40	59530	198.1
A-4	9702	HEADQUARTERS	602	185	787	6	16007	344.6
B-1	9524	B.O.Q.	167	201	368	11	17310	243.4
B-2	9545	BARRACKS	1081	103	1184	3	8906	223.0
B-3	2205	BARRACKS	6549	1998	8547	31	172224	206.0
B-4	5422	BARRACKS/MESS	22016	47732	69748	1045	4114870	211.9
CS-1	9510	THEATRE	1257	1471	2728	106	126752	224.7
CS-2	9631	BARBER SHOP	266	42	308	1	3552	267.8
CS-4	5346	EDUCATION CENTER	812	889	1701	36	76607	417.5
CS-5	2009	GYMNASIUM	2034	2491	4525	80	214739	223.1
CS-6	4522	SERVICE STATION	333	461	794	12	39730	257.2
CS-7	2395	BOWLING CENTER	4971	5749	10720	140	495586	526.0
CS-8	10762	DAY ROOM	396	149	545	4	12886	436.0
CS-9	8568	TRANSPORTATION OFFICE	540	486	1026	22	41906	217.4
CS-10	2558	LATRINE	277	25	302	1	2165	843.6
CS-11	4282	TELEPHONE EXCHANGE BLDG.	247	1346	1593	28	116077	437.6
D-1	12111	MESS	250	630	880	35	54347	372.9
D-2	3210	MESS	6365	6426	12791	105	553949	963.2
D-3	3630	OFFICER'S MESS	2047	3638	5685	149	313670	273.5
E-2	5615	PRIMARY EDUCATION	10089	1381	11470	36	119017	506.0
FH-1	3773	FAMILY HOUSING	647	765	1412	19	65984	150.1
FH-2	5724	FAMILY HOUSING	531	754	1285	36	65009	234.1
FH-3	6832	FAMILY HOUSING	342	244	586	10	21057	201.4
FH-4	6841	FAMILY HOUSING	434	229	733	12	25761	342.2

TABLE 2 (CONT'D)
TYPICAL BUILDING ENERGY CONSUMPTION DATA
FORT JACKSON

GROUP NO.	BLDG	BUILDING DESCRIPTION	ANNUAL ENERGY SOURCE CONSUMPTION BTUx10 ⁶			ELEC'L ENER. CONSUMPTION		BTU x 10 ³ FT ²
			FUEL	ELEC.	TOTAL	KW PEAK	KWH/YR	
FH-5	5716	FAMILY HOUSING	298	257	555	10	22192	246.7
FH-6	3600	FAMILY HOUSING	182	178	360	7	15919	177.1
FH-7	3803	FAMILY HOUSING	125	151	276	5	13002	76.9
H-1	6549	OFFICE MOTIVATION PLATOON	588	67	655	2	5906	286.8
H-4	4323	DENTAL CLINIC	1624	1661	3285	48	143161	276.1
I-1	10404	TRAINING	1013	676	1689	40	58928	450.8
I-3	5462	FIRST-AID CLASSROOM	994	605	1601	21	52116	306.3
I-4	2300	INSTRUCTION FACILITY	2325	2502	4827	66	215726	71.3
L-1	1561	LAUNDRY	31190	1847	33037	103	159245	616.8
LA-1	9504	LABORATORY	567	508	1075	18	49828	185.9
LA-2	1895	RECEPTION PROCESSING	26059	4422	30481	152	381223	231.1
M-1	6500	MAINTENANCE	396	3	399	.1	276	128.4
M-2	3033	MOTOR REPAIR SHOP	328	350	678	7	30145	141.6
M-3	1611	TANK REPAIR SHOP	2499	1084	3583	40	93422	144.3
R-1	12104	CHAPEL	375	478	853	62	126216	221.8
R-2	11550	CHAPEL	399	321	771	10	27680	233.6
U-2		ALL BLDGS. IN THE GROUP	0	5708	5708	56	492099	605.5
U-3		ALL BLDGS. IN THE GROUP	0	18920	18920	180	1579297	5045.4
U-4	5485	HEATING & COOLING PLANT	369	3390	3759	33	292234	596.4
W-1	2530	WAREHOUSE	341	330	671	12	28430	71.6
X		NO UTILITIES	← N/A →					
Z	ALL OF GROUP	ELECTRIC ONLY	0	26594	26594	-	2292608	N/A

TABLE 3
BUILDING OCCUPANCY
FORT JACKSON

GROUP NO.	BLDG.	BUILDING DESCRIPTION	NORMAL PEAK POPULATION	OCCUPANCY
A-1	2200	SUPPLY/STORAGE	9	WEEKDAYS - 7:00 A.M. TO 6:00 P.M.
A-2	4340	BRIGADE HEADQUARTERS	40	WEEKDAYS - 7:30 A.M. TO 5:00 P.M.
A-3	5448	ADMINISTRATION	24	WEEKDAYS - 8:00 A.M. TO 5:00 P.M.
A-4	9702	HEADQUARTERS	10	OPEN 24 HOURS
B-1	9524	B.O.Q.	19	OPEN 24 HOURS
B-2	9545	BARRACKS	28	OPEN 24 HOURS
B-3	2205	BARRACKS	290	OPEN 24 HOURS
B-4	5422	BARRACKS/MESS	1200	OPEN 24 HOURS
CS-1	9510	THEATRE	1000	7 DAYS A WEEK - NOON TO 11:00 P.M.
CS-2	9631	BARBER SHOP	6	MONDAY THRU SATURDAY - 8:00 A.M. TO 5:00 P.M.
CS-4	5346	EDUCATION CENTER	33	MONDAY THRU THURSDAY - 7:30 A.M. TO 9:15 P.M. FRIDAY - 7:30 A.M. TO 4:15 P.M., SATURDAY - 7:30 A.M. TO 11:30 A.M.
CS-5	2009	GYMNASIUM	700	7 DAYS A WEEK - 8:00 A.M. TO 8:00 P.M.
CS-6	4522	SERVICE STATION	8	WEEKDAYS - 7:30 A.M. TO 7:00 P.M., SATURDAY - 9:00 A.M. TO 6:00 P.M. SUNDAY - 11:00 A.M. TO 5:00 P.M.
CS-7	2395	BOWLING CENTER	360	MONDAY THRU FRIDAY - 4:00 P.M. TO 11:00 P.M. SATURDAY, SUNDAY & HOLIDAYS - 10:00 A.M. TO 11:00 P.M.
CS-8	10762	DAY ROOM	25	WEEKDAYS - 4:30 P.M. TO 10:00 P.M.
CS-9	8568	TRANSPORTATION OFFICE	30	WEEKDAYS - 8:00 A.M. TO 5:00 P.M.
CS-10	2558	LATRINE	15	WEEKDAYS - 6:00 A.M. TO 8:00 P.M.
CS-11	4282	TELEPHONE EXCHANGE BLDG.	10	7 DAYS A WEEK - 7:30 A.M. TO 11:00 P.M.
D-1	12111	MESS	86	WEEKDAYS - 5:00 A.M. TO 7:00 P.M.
D-2	3210	MESS	250	WEEKDAYS - 6:00 A.M. TO 7:00 P.M.
D-3	3630	OFFICER'S MESS	80	7 DAYS A WEEK - 8:00 A.M. TO 1:00 P.M.
E-2	5615	PRIMARY EDUCATION	320	WEEKDAYS - 8:00 A.M. TO 4:00 P.M.
FH-1	3773	FAMILY HOUSING	32	OPEN 24 HOURS
FH-2	5724	FAMILY HOUSING	16	OPEN 24 HOURS
FH-3	6832	FAMILY HOUSING	8	OPEN 24 HOURS
FH-4	6841	FAMILY HOUSING	8	OPEN 24 HOURS
FH-5	5716	FAMILY HOUSING	8	OPEN 24 HOURS
FH-6	3600	FAMILY HOUSING	4	OPEN 24 HOURS
FH-7	3803	FAMILY HOUSING	8	OPEN 24 HOURS
H-1	6549	OFFICE MOTIVATION PLATOON	10	OPEN 24 HOURS
H-4	4323	DENTAL CLINIC	50	WEEKDAYS - 7:30 A.M. TO 4:15 P.M.
I-1	10404	TRAINING	30	WEEKDAYS - 8:00 A.M. TO 5:00 P.M.
I-3	5462	FIRST AID CLASSROOM	30	WEEKDAYS - 8:00 A.M. TO 5:00 P.M.
I-4	2300	INSTRUCTION FACILITY	376	WEEKDAYS - 6:30 A.M. TO 3:30 P.M.
L-1	1561	LAUNDRY	81	WEEKDAYS - 7:30 A.M. TO 4:00 P.M.
LA-1	9504	LABORATORY	15	WEEKDAYS - 7:00 A.M. TO 4:00 P.M.
LA-2	1895	RECEPTION PROCESSING	90	WEEKDAYS - 6:00 A.M. TO 5:00 P.M.

TABLE 3 (CONT'D)
BUILDING OCCUPANCY
FORT JACKSON

[illegible]

TABLE 4

Building Group Source Energy Consumption

Group	Description	Group Sq. Ft.	Total Source Consumption ₆ Btu's x 10 ⁶
A	Administrative	708,941	178,148
B	Barracks	4,113,791	875,800
CS	Community Service	618,388	202,655
D	Dining	371,309	243,599
E	Education Facilities	64,069	32,460
F	Family Housing	1,716,078	366,282
H	Hospital	530,170	148,062
I	Instruction Facilities	535,602	139,761
L	Laundry	53,565	33,037
LA	Laboratory Facilities	233,217	49,376
M	Maintenance	346,535	45,550
R	Religious Facilities	64,067	14,127
W	Warehouse	535,781	38,355
U-2	Water Treatment	9,427	5,708
U-3	Pump Houses	3,631	18,320
U-4	Boiler Plants	43,880	26,313
X	Buildings with no Utilities	115,555	
Z	Electric Only (includes outdoor lights)	145,766	108,443

ENERGY CONSERVATION PROJECTS
SOURCE ENERGY SAVINGS

BUILDING TYPE	ENERGY SAVINGS 'BTUx1,000,000	% BASEWIDE REDUCTION FY'75	PROJECT NUMBER
FAMILY HOUSING	47,466 37,927 19,353 <u>104,746</u>	1.82 1.45 0.74 <u>4.01</u>	T-507 T-521 T-520
BARRACKS	1,420 45,374 40,872 10,130 <u>97,796</u>	.05 1.74 1.57 .39 <u>3.75</u>	T-510 T-509 T-518 T-539
INCINERATOR FACILITY	81,113	3.11	T-529
STEAM PLANTS	26,451	1.01	T-517
SELECTIVE ENERGY PLANT	140,000	5.36	
OTHER BUILDINGS AFFECTED BY ECIP'S	15,883 14,318 25,239 91,438 <u>146,878</u>	.61 0.55 0.97 3.50 <u>5.63</u>	T-510 T-518 T-520 T-539
TOTAL	596,984	22.87	

TABLE 5

ENERGY CONSERVATION PROJECTS DEVELOPED SCHEDULE - FT. JACKSON, SOUTH CAROLINA

PROJECT TITLE	PROJECT NUMBER	RECOMMENDED FISCAL YEAR	COST \$ x 1000	E/C RATIO	ENERGY SAVINGS BTUx1,000,000	YEARS PAYBACK	B/C RATIO
RELAMPING FLUORESCENT FIXTURES	T-510	1980	227	76.4	17,303	1.8	4.5
STORM WINDOWS, WEATHERSTRIP DOORS, AND KITCHEN LIGHTING FIXTURE IN FAMILY HOUSING	T-507	1980	1044	47.9	47,466	6.4	2.8
INSULATED PANELS, STORM WINDOWS, HALL LIGHTING FIXTURES, AND WEATHERSTRIP DOORS IN PERMANENT BARRACKS	T-509	1980	1495	30.4	45,374	8.1	2.3
TOTAL			2766		110,143		
FAMILY HOUSING EQUIPMENT MODIFICATIONS (ECIP)	T-521	1981	1084	36.9	37,927	11.5	1.7
ADJUST FRESH AIR QUANTITIES	T-518	1981	268	205.8	55,190	1.5	12.3
STEAM PLANT MODIFICATIONS	T-517	1981	301	87.9	26,451	3.6	5.5
FM RADIO CONTROL SYSTEM	T-520	1981	600	74.3	44,592	2.4	5.1
TOTAL			2253		164,160		
SOLID WASTE BURNING INCINERATOR FACILITY	T-529	1982	3182	25.5	81,113	22.5	1.1
EMCS EXTENSION	T-539	1982	862	117.8	101,568	2.6	4.9
TOTAL			4044		182,681		
SELECTIVE ENERGY PLANT		1983	27400	N/A	140,000	14.0	1.7
TOTAL			27400		140,000		

TABLE 6

TABLE 7

FY81 Average Energy Costs

Electricity		
Demand		\$6.85/kW
kWh (without demand)		\$.02337/kWh
kWh (including demand)		\$.03702/kWh
Natural Gas		
Firm		\$2.645/mcf
Interruptible		\$3.525/mcf
Combination		\$3.308/mcf
Propane		
Commodity		\$0.6239/gal.
Fuel Oil		
No. 2		\$1.22/gal.
No. 6		\$.87/gal.

$$10,000,000 \text{ kWh} \times \frac{1}{95,500 \text{ kWh}} \times \frac{\$}{\text{kWh}} =$$

$$10,000,000 \times \frac{\$}{\text{kWh}} =$$

TABLE 8
Summary of Increment F Projects

Project	Location(s)	Energy Savings/Year MMBtu	Dollar Savings/Year	Payback Years	B/C	E/C	Contract Cost	In-House Cost		Reference Pages
								Material	Manhours	
Reduction-of-Ventilation Air Quantities	14 Bldgs.	52,674	\$ 243,354	.02	1274.	9,177	\$ 5,740	\$ 0	A/C Mechanic 265	8 A1
Cycle Pool Pumps	5 pumps	1,135	3,019	.17	122.	2,154	527	270	Electrician 4	35 A163
Chilled Water Supply Modification in Laundry Rooms	5422 and 5482	2,820	13,028	0.2	265.	1,912	1,475	417	A/C Mechanic 40	19 A77
Water Restrictors (Hot)	Per Unit Basis	10.9	62.7	.13	201.0	1,351	8.07	3.70	Laborer .1	32 A137
Receptacle Insulation	Family Housing	20,053	87,967	0.3	74.0	669	29,954	3,943	Laborer 1,149	16 A48
Swimming Pool Cover	Bldg. 3296	2,245	10,372	.4	79.0	568	4,000	-	-	39 A197
Furnace Derating	Family Housing	5,676	26,223	0.4	77.0	555	10,221	0	Heat Shop 383	30 A129
Filter Maintenance	Basewide	11,411	9,535	0.8	18.3	295	38,619	7,707	Laborer 2,080	14 A37
Insulate Water Heaters	Family Housing	3,024	13,971	1.2	25.0	181	16,747	3,964	Laborer 575	38 A189
Reduce Infiltration in Family Housing	Family Housing	41,776	182,982	1.8	14.0	126	332,419	80,425	Laborer 12,064	12 A26
Photocells for Warehouse Exterior Lighting	Warehouses	133	561	2.0	10.7	120	1,109	398	Electrician 21	18 A65
Solar Film (West)	Sq. Ft. Basis	.1302	.60	5.6	5.4	39	2.54	--	--	23 A93
Solar Film (Southwest)	Sq. Ft. Basis	.1231	.57	5.9	5.1	37	2.54	--	--	23 A93

TABLE 8
Summary of Increment F Projects
Continued

Project	Location(s)	Energy Savings/Year MMBtu	Dollar Savings/Year	Payback Years	B/C	E/C	Contract Cost	In-House Cost		Reference Pages
								Material	Manhours	
Window Insulation	26 Bldgs.	2,555	11,804	6.2	4.9	35	72,926	32,364	Laborer 2,342	10 A17
Electronic Ignition in Furnaces	Family Housing	8,321	37,875	6.4	4.5	34	242,139	133,214	Heat Shop 2,300	28 A118
Solar Film (East)	Sq. Ft. Basis	.1095	.51	6.6	4.6	33	2.54	--	--	23 A93
Solar Film (Southeast)	Sq. Ft. Basis	.1023	.47	7.1	4.2	31	2.54	--	--	23 A93
Solar Film (Northwest)	Sq. Ft. Basis	.0961	.44	7.6	3.9	29	2.54	--	--	23 A93
Vent Restrictors	Family Housing	3,677	16,988	7.8	3.8	28	133,177	7,866	Heat Shop 5,900	27 A110
Vent Dampers	Family Housing	4,900	22,638	8.0	3.7	27	181,605	72,435	Heat Shop 2,873	25 A101
Solar Film (Northeast)	Sq. Ft. Basis	.0891	.41	8.2	3.7	27	2.54	--	--	23 A93
Solar Film (South)	Sq. Ft. Basis	.0829	.38	8.8	3.4	25	2.54	--	--	23 A93
Variable Air Volume	Bldg. 3319	563	2,376	11.0	2.0	21	26,300	11,421	A/C Mechanic 405	21 A85
Indoor Swimming Pool Lighting Upgrade	Bldg. 3296	856	11,218	3.1	3.9	20	34,830	20,508	Electrician 192	37 A178
Solar Film (North)	Sq. Ft. Basis	.0588	.27	12.4	2.4	18	2.54	--	--	23 A93
Fluorescent Lighting Ballast Replacement	Per Unit Basis	.386	1.63	16.0	1.3	15	26.0	26.0	0	17 A58
Skylights	Bldg. 3296	375	1,013	32.0	0.7	12	32,000	8,413	Laborer 480	41 A210
Water Restrictors (Cold)	Per Unit Basis	0	12.4	0.7	14.0	0	8.07	3.70	Laborer .1	32 A137

TABLE 8
Summary of Increment F Projects
Continued

Project	Location(s)	Energy Savings/Year MMBtu	Dollar Savings/Year	Payback Years	B/C	E/C	Contract Cost	In-House Cost		Reference Pages	
								Material	Manhours	Narr.	Calcs.
Toilet Tank Dams	Family Housing	0	6,819	1.4	6.6	0	9,355	4,129	Laborer 191	34	A156
Flush Valve Restrictors	Basewide	0	26,700	0.6	15.0	0	16,604	8,198	Laborer 267	33	A145
Computer Room Modification	Bldg. 2572	-95	1,180	2.5	2.0	-32	2,938	2,174	A/C Mechanic 32	36	A169

TABLE 9

Summary of Project Data - Increment G

Project	Location(s)	Energy Savings/Year MMBtu	Dollar Savings/Year	Payback Years	B/C	E/C	Contract Cost	In-House Cost		Reference Pages	
								Material	Manhours	Narr.	Calcs.
Operating Room Modifications	Moncrief Hospital	4,162	\$19,228	0.13	219.	1,580	\$2,600	-	-	35	B-217
Submersible Pumps for Valve Pits	Building 3300	357	1,724	0.2	164.	1,170	305	\$ 178	Electrician 1.5	23	B-147
Bulb-Type Thermostats	Basewide	213,334	985,603	0.2	136.	995	214,438	180,720	Electrician 2,050	26	B-164
Pipe Insulation	111 Buildings	19,816	91,550	0.5	57.	412	48,032	15,465	Insulator 1,124	25	B-155
Variable Speed Chilled Water Pumping	Bldgs. 1699, 2288, and 4333	27,169	72,270	1.4	15.4	272	99,960	75,500	Electrician 50	13	B-91
FM Control System Expansion	Postwide	68,516	316,544	2.4	12.3	89	772,000	359,000	Electrician 8,736	37	B-228
Automatic Chiller Condenser Tube Cleaning	2 - 700 ton centra-vac	4,777	22,070	2.5	12.5	86	55,556	-	-	4	B-1
Automatic Chiller Condenser Tube Cleaning	2 - 1,165 ton absorption	7,719	35,662	3.5	8.5	61	126,180	-	-	4	B-1
Fluorescent Lighting Load Reduction	Basewide	17,066	141,397	2.1	9.7	57	296,672	157,813	Laborer 2,612	6	B-50
Automatic Chiller Condenser Tube Cleaning	5 - 700 ton absorption	11,944	55,181	4.0	7.5	54	220,881	-	-	4	B-1
Automatic Chiller Condenser Tube Cleaning	1 - 600 ton absorption	1,988	9,185	4.6	6.5	47	42,675	-	-	4	B-1
Boiler Upgrade	1 Barracks	196	906	4.8	6.2	45	4,390	2,763	Heat Shop 16	11	B-83

TABLE 9

Summary of Project Data - Increment G
(Continued)

Project	Location(s)	Energy Savings/Year MMBtu	Dollar Savings/Year	Payback Years	B/C	E/C	Contract Cost	In-House Cost		Reference Pages	
								Material	Manhours	Narr.	Calcs.
Automatic Chiller Condenser Tube Cleaning	1 - 235 ton centra-vac	802	3,705	5.0	6.1	44	18,374	-	-	4	B-1
Hospital Modifications	Bldg. 4500	29,460	\$136,105	4.9	6.1	44	\$667,200	-	-	33	B-203
Variable Speed Hot Water Pumping	Bldgs. 1699, 2288, and 4333	5,173	13,760	8.6	2.5	44	118,494	\$103,488	Electrician	96	B-99
EMCS Extension	Moncrief Hospital	8,403	38,822	5.7	5.3	38	221,000	-	-	31	B-191
Ceiling Fans	26 Buildings	1,737	9,201	6.4	4.9	30	58,700	21,438	Electrician General	8	B-68
Window Reduction	Permanent Barracks and Mess Halls	15,705	72,834	7.5	4.0	29	546,267	288,285	Carpenter	10,519	B-118
Automatic Chiller Condenser Tube Cleaning	1 - 235 ton absorption	802	3,705	8.0	3.7	27	29,767	-	-	4	B-1
Insulate Warehouse Offices	2500 and 3500 Areas	1,376	6,357	9.1	3.3	24	58,035	22,254	Laborer	1,472	B-108
Storm Doors	Family Housing	4,534	20,152	10.5	2.5	21	212,440	115,016	Carpenter	1,149	B-131
Infra-Red Heating	5 Buildings	667	3,082	15.0	2.0	14	46,717	18,178	Heat Shop	924	B-176
Replace Incandescent Lighting with HPS	Hospital Area Per Unit Basis	4.95	13.2	19.1	.9	12	423	269	Electrician	2	B-142